ROYAL ASTRONOMICAL SOCIETY.

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Dr. LEE, V.P., in the Chair.

John Saunders Muir, Esq., 15 Harrington Square;
R. Hartley Kennedy, Esq., Kennington Lodge;
George Hamilton, Esq., Egremont, Cheshire; and
William Tomlinson, Esq., Grove Lodge, York,

were balloted for and duly elected Fellows of the Society.

Dr. Brünnow, Ann Arbor, Michigan;
Lieut. M. F. Maury, U.S.N., Director of the National Observatory, Washington; and
Dr. Benj. Althorpe Gould, Cambridge, Massachussets,

were balloted for and duly elected Associates of the Society.

Professor Hansen has announced in a letter to the Astronomer Royal that his Lunar Tables are steadily advancing towards completion. The Lords of the Admiralty have assigned to him an additional grant of 100*l.* towards defraying the expense of their construction.

The *Astronomical Journal*, edited by Dr. B. A. Gould, may be obtained of Messrs. Trübner and Co., 12 Paternoster Row, who have been appointed agents for the sale of that publication in England. It is published at irregular intervals in numbers twenty-four of which form a volume. The price of each volume is 25*s.*

Extract of a Letter from Thomas Maclear, Esq. on the Observations of Schweizer's Comet (Comet II. 1853).

"I hasten to submit to the Royal Astronomical Society with the least practicable delay the accompanying REVISAL copy of the observations made here on Schweizer's Comet.

"On receiving last Tuesday the Society's Notice, No. 8, vol. xiv., which contains Professor Challis's determination of the mean places of the stars compared with the comet, I referred to Notice No. 1 of the same volume to collate the approximate places

sent from hence, when the accidental sight of an expression detected an oversight in the reduction of a considerable portion of the comet comparisons,—viz. the measures on the parallel for differences in right ascension by means of the micrometer screw (marked by the letter *d* in column 8) were inadvertently multiplied instead of divided by *sine north polar distance;* and the signs of those of May 20, 21, and June 4, should be changed.

"The present paper represents the observations corrected for the effect of refraction; and I rather hope than expect that it may be received in time to prevent any use being made of the former communication for the elements of the orbit. Moreover, I shall exceedingly regret if the oversight above mentioned should impair the confidence these observations deserve.

THOMAS MACLEAR.

"P.S. Referring to the original register of the observations for the approximate place of star No. 21, where there is a diagram of the field of the telescope, there must have been an error in copying, for the difference in R.A. is there entered + 4^s, and in polar distance — 11′ 17″.

"On referring this week to the heavens, I find by micrometric measurement, corrected for refraction, + $4^s{\cdot}455$ and — 11′ 23″·18. Applying these numbers to the mean place of star 20 given by Professor Challis, the R.A. of star 21 is $7^h\ 11^m\ 19^s{\cdot}33$, N.P.D. 103° 26′ 24″·55."

Revised Copy of the Observations made on Schweizer's Comet at the Cape of Good Hope. By Thomas Maclear, Esq.

The observations are corrected for refraction only.

The letters *t* and *d* in column 8 denote respectively the right-ascension differences obtained by transits, or by the subtense of the spider lines as given by the micrometer scale.

1853.	Cape Mean Time.	Difference in R.A.	No. of Obs. in R.A.	Difference in N.P.D.	No. of Obs. in N.P.D.	No. of Star.	
	h m s	m s		′ ″			
May 1	7 46 28·10	...	...	+2 50·24	2	1	
	7 56 37·29	−1 46·532	2	...	...	1	*t*
	8 6 17·36	...	...	+3 38·17	2	1	
	8 26 37·32	...	...	+4 25·86	5	1	
	8 37 17·28	−0 34·479	1	...	...	1	*t*
3	7 19 49·87	...	...	+5 12·82	3	2	
	7 42 23·62	−1 12·658	4	...	...	2	*t*
	7 42 23·62	−1 34·739	4	...	...	3	*t*
	7 42 23·62	−1 53·530	4	...	...	4	*t*
	7 56 28·52	...	...	+5 25·34	3	2	
	8 10 29·46	−0 50·447	3	...	...	2	

Clouded on the 2d.

1853.	Cape Mean Time.	Difference in R.A.	No. of Obs. in R.A.	Difference in N.P.D.	No. of Obs. in N.P.D.	No. of Star.	
	h m s	m s		′ ″			
May 3	9 11 36·35	−0 1·623	8	...	...	2	*t*
	9 18 32·71	...	...	+ 5 41·45	1	2	
4	6 35 11·59	...	...	− 4 56·02	2	5	
	6 57 18·62	+0 34·348	9	...	...	5	*t*
	6 57 18·62	−0 17·970	9	...	...	6	*t*
	7 14 42·60	...	...	− 3 19·55	2	6	
	7 22 54·73	−0 3·370	9	...	...	6	*t*
	7 35 59·60	...	...	− 3 20·31	2	6	
	8 8 11·72	+0 25·340	5	...	...	6	*t*
	8 30 21·54	...	...	− 3 19·85	3	6	
	8 44 49·83	+0 44·486	3	...	...	6	*t*
	8 10 53·45	−1 22·002	3	...	...	7	*t*
	8 30 21·54	...	...	− 1 4·42	3	7	
	8 50 28·63	−0 58·841	6	...	...	7	*t*
	9 13 5·16	...	...	− 1 7·67	2	7	
5	7 0 27·44	...	...	+11 28·42	1	8	
	7 37 17·49	−7 29·912	1	...	...	8	*t*
7	7 3 43·40	+1 14·379	4	...	...	9	*t*
	7 19 37·18	...	...	−10 13·21	2	9	
	7 36 1·49	+1 22·408	3	...	...	9	*t*
	8 3 37·29	...	...	−10 23·67	3	9	
	9 3 57·54	...	...	−10 31·27	2	9	
	9 11 16·84	+1 47·781	1	...	...	9	*t*
	7 3 43·40	−0 46·079	4	...	...	10	*t*
	7 25 34·21	...	...	− 7 36·70	2	10	
	7 36 1·49	−0 37·838	3	...	...	10	*t*
	8 35 1·80	...	...	− 7 52·92	2	10	
	9 11 16·84	−0 12·661	1	...	...	10	*t*
8	6 23 36·26	−0 34·350	4	...	...	11	*t*
	6 44 36·46	...	...	− 1 28·88	2	11	
	6 23 36·26	−1 1·502	4	...	...	12	*t*
	6 50 2·67	...	...	+ 3 59·82	2	12	
	6 23 36·26	−2 20·278	4	...	...	13	*t*
	7 0 22·20	...	...	+10 54·81	3	13	
9	7 2 3·47	+2 31·153	2	...	...	13	*t*
	7 30 53·78	+2 36·305	1	...	...	13	*t*
	7 43 20·78	...	...	+ 6 47·17	3	13	
	8 2 31·62	+2 42·029	5	...	...	13	*t*
	8 19 33·00	...	...	+ 6 39·63	2	13	

May 5. Owing to clouds these observations only could be obtained.

7. Angle of position of comet's tail, 118° 40′. No. 10 is in the comet's tail.

9. Angle of position of comet's tail, 121° 30′. Nucleus remarkably bright.

1853.	Cape Mean Time.	Difference in R.A.	No. of Obs in R.A.	Difference in N.P.D.	No. of Obs. in N.P.D.	No. of Star.	
	h m s	m s		′ ″			
May 10	7 11 44·27	...	...	−3 6·40	2	14	
	7 30 39·76	−0 27·602	1	...	...	14	*t*
11	6 36 25·27	+0 44·368	3	...	...	15	*t*
	7 0 34·48	...	...	+5 37·06	4	15	
	7 21 27·38	+0 50·129	4	...	...	15	*t*
	8 12 59·09	...	...	+5 20·65	4	15	
	8 32 5·06	+0 58·440	4	...	...	15	*t*
	6 36 25·27	−1 37·933	3	...	...	16	*t*
	7 0 34·48	...	...	+1 2·07	4	16	
	7 21 27·38	−1 32·201	4	...	...	16	*t*
	8 12 59·09	...	...	+0 45·13	4	16	
	8 32 5·06	−1 23·953	4	...	...	16	*t*
12	6 41 44·35	...	...	+1 20·44	6	17	
	6 54 57·74	−0 1·515	8	...	...	17	*d*
	7 2 55·05	−0 0·727	9	...	...	17	*d*
	7 15 7·60	...	...	+1 14·82	9	17	
	7 36 9·97	+0 2·656	14	...	...	17	*d*
	8 10 38·13	...	...	+1 5·85	5	17	
	8 19 36·27	+0 7·158	5	...	...	17	*d*
14	7 27 56·82	...	...	−5 52·53	3	17	
	8 4 32·88	+4 28·769	5	...	...	17	*t*
	8 42 50·40	...	...	−6 6·18	5	17	
15	6 32 58·31	...	...	+3 34·95	5	18	
	6 49 34·79	−0 37·701	5	...	...	18	*t*
	7 7 42·58	−0 36·625	5	...	...	18	*d*
	7 24 52·76	...	...	+3 27·48	5	18	
	7 40 2·46	−0 34·625	5	...	...	18	*d*
	7 49 22·93	...	...	+3 22·72	5	18	
	8 0 34·68	−0 33·223	5	...	...	18	*d*
	8 11 40·64	...	..	+3 20·33	5	18	
16	6 20 43·76	...	...	+7 42·41	5	19	
	6 32 35·81	−0 27·532	5	...	...	19	*d*
	6 40 49·26	...	...	+7 38·85	5	19	
	6 53 34·76	−0 26·166	5	...	...	19	*d*
	7 3 28·35	...	...	+7 37·75	5	19	
	7 14 24·55	−0 24·868	5	...	...	19	*d*
	7 21 15·63	...	...	+7 33·79	5	19	

May 10. Clouded after these observations.
11. Angle of position of comet's tail, 115° 40′. Nucleus less bright; halo round the head more diffused.
12. Angle of position of comet's tail, 117° 30′
14. ,, ,, 118 0 Clouds.
15. ,, ,, 117 35

1853.	Cape Mean Time. h m s	Difference in R.A. m s	No. of Obs. in R.A.	Difference in N.P.D. ′ ″	No. of Obs. in N.P.D.	No. of Star.	
May 16	7 37 17·40	−0 23·256	5	...	...	19	*d*
	7 49 10·05	...	...	+7 28·26	5	19	
	7 57 44·84	−0 22·118	5	...	...	19	*d*
	8 21 20·18	...	...	+7 23·12	5	19	
17	6 15 6·14	−0 17·635	5	...	...	20	*d*
	6 16 0·00	−0 22·284	5	...	...	21	*d*
	6 58 51·77	...	...	−7 56·53	5	20	
	7 5 4·55	...	...	+3 26·32	5	21	
	7 16 43·34	−0 14·416	5	...	...	20	*d*
	7 18 12·00	−0 19·047	5	...	...	21	*d*
	7 28 54·65	...	...	−8 0·01	5	20	
	7 34 51·87	...	...	+3 26·49	5	21	
	7 47 36·38	−0 12·801	5	...	...	20	*d*
	7 48 38·21	−0 17·328	5	...	...	21	*d*
	8 4 19·63	...	...	−8 0·36	5	20	
	8 9 58·11	...	...	+3 17·34	5	21	
20	6 42 20·46	−0 13·130	5	...	...	22	*d*
	6 49 23·50	...	...	−0 48·62	5	22	
	6 55 1·77	−0 12·631	5	...	...	22	*d*
	7 2 55·48	...	...	−0 51·64	5	22	
	7 8 59·68	−0 11·939	5	...	...	22	*d*
	7 15 43·57	...	...	−0 50·25	5	22	
	7 21 17·66	−0 11·499	5	...	...	22	*d*
21	6 41 26·83	...	...	+6 3·15	5	23	
	6 49 47·26	+0 15·169	5	...	...	23	*d*
	6 55 44·28	...	...	+6 3·05	5	23	
	7 2 29·57	+0 15·464	5	...	...	23	*d*
	7 9 28·82	...	...	+6 1·23	5	23	
23	6 35 26·93	...	...	+7 51·42	5	24	
	6 48 36·57	−0 2·862	5	...	...	24	*d*
	7 0 21·44	−0 2·726	5	...	...	24	*d*
	7 9 41·51	−0 2·275	5	...	...	24	*d*
	7 18 44·82	...	...	+7 41·29	5	24	
28	6 27 55·21	...	...	+4 55·45	5	25	
	6 45 59·48	−0 31·904	5	...	...	25	*d*
	6 56 48·34	−0 31·935	5	...	...	25	*d*
	7 6 1·61	...	...	+4 51·99	5	25	
29	6 13 20·56	−0 6·919	5	...	...	25	*d*

May 17. Angle of position of comet's tail 118° 45′.
20. The comet is faint, partly owing to the moonlight. The tail barely distinguishable.
22. Thin clouds. The comet is very indistinct.
29. The comet is very faint.

1853.	Cape Mean Time.	Difference in R.A.	No. of Obs. in R.A.	Difference in N.P.D.	No. of Obs. in N.P.D.	No. of Star.	
	h m s	m s		′ ″			
May 29	6 20 29·69	...	...	+2 32·25	5	25	
	6 29 17·02	−0 6·573	5	...	...	25	*d*
	6 35 10·81	...	...	+2 30·35	5	25	
	6 40 52·64	−0 6·273	5	...	...	25	*d*
31	6 24 32·60	+0 38·938	5	...	...	25	*d*
	6 31 0·12	...	...	−2 5·16	5	25	
	6 37 46·37	+0 38·917	5	...	...	25	*d*
	6 46 57·97	...	...	−2 9·65	5	25	
	6 54 6·78	+0 38·865	5	...	...	25	*d*
June 1	6 27 12·98	...	...	+10 1·96	5	26	
	6 34 57·26	−0 50·387	5	...	...	26	*d*
	6 41 52·68	...	...	+9 58·95	5	26	
	6 50 17·87	−0 49·796	5	...	...	26	*d*
	7 14 34·44	−0 48·083	3	...	...	26	*t*
	7 14 34·44	+1 0·237	3	...	...	25	*t*
	7 24 49·65	...	...	−4 23·62	5	25	
2	6 27 25·54	+1 18·965	3	...	...	25	*t*
	6 45 16·64	...	...	−6 26·94	4	25	
	7 1 22·02	+1 19·253	2	...	...	25	*t*
	6 27 25·54	−1 24·261	3	...	...	27	*t*
	6 45 16·64	...	...	−2 53·07	4	27	
	7 1 22·02	−1 23·896	2	...	...	27	*t*
3	6 36 53·39	...	...	+5 54·40	5	26	
	6 45 8·39	−0 11·989	5	...	...	26	*d*
	6 52 20·58	...	...	+5 53·80	5	26	
4	7 7 22·67	...	...	+3 53·75	1	26	
	7 13 12·69	+0 5·810	2	...	...	26	*d*
	7 25 19·64	...	...	+3 47·42	2	26	
5	6 34 48·27	...	...	+2 4·91	3	26	
	6 45 21·34	+0 22·608	5	...	...	26	*d*
	6 55 12·79	...	...	+2 4·20	3	26	
7	6 35 58·61	...	...	−1 22·38	3	26	
	6 47 3·93	+0 54·498	10	...	...	26	*d*
	6 58 43·86	...	...	−1 24·30	5	26	
	7 16 36·13	+0 54·550	10	...	...	26	*t*
	7 31 40·34	...	...	−1 26·34	2	26	
8	6 49 9·52	+1 8·199	5	...	...	26	*t*
	7 7 54·37	...	...	−2 59·49	10	26	
	7 26 44·26	+1 9·505	3	...	...	26	*t*

June 1. The measurements diminish in precision owing to the faintness of the comet.

3. The comet is very faint.

4. Generally clouded. These observations only could be obtained.

1853.	Cape Mean Time.	Difference in R.A.	No. of Obs. in R.A.	Difference in N.P.D.	No. of Obs. in N.P.D.	No. of Star.	
	h m s	m s		′ ″			
June 9	6 23 37·43	...	...	−4 22·13	5	26	
	6 38 11·42	+1 23·619	7	...	...	26	
	6 56 13·48	...	...	−4 23·55	5	26	
10	6 23 48·76	...	...	−5 47·12	5	26	
	6 39 39·45	+1 38·681	5	...	...	26	*t*
	6 54 45·86	...	...	−5 48·28	5	26	
11	6 34 14·35	...	...	+4 51·73	5	28	
	6 45 47·37	−0 23·449	5	...	...	28	*d*
	6 55 0·64	...	...	+4 50·24	5	28	

June 10. The moonlight is now diminishing the visibility of the comet.

"*Royal Observatory, Cape of Good Hope, Nov. 12th*, 1854."

On the Telescopic Appearances of Saturn with a 7½-inch Object-Glass. By the Rev. W. R. Dawes.

In the spring of last year (1854) I availed myself of an opportunity of increasing the optical means in my possession, by the purchase of a 7½-inch object-glass, having a focal length of nearly 9½ feet. It is the work of Mr. Alvan Clark, of Boston, U.S., who has long been known in that city as a most successful painter of portraits, but took to the manufacture of telescopes as an amateur. Being dissatisfied with reflectors, on which he commenced his operations, he attempted the manufacture of object-glasses; and succeeded so well, that in the autumn of 1851 he communicated to me the places of some new and very close double stars, which he had discovered with glasses whose apertures were 4¾ and 5¼ inches. In the following year he completed an object-glass of 7⅞ inches aperture for the observatory at Williams's College, which was tried at the Harvard Observatory by the Messrs. Bond, and highly approved: immediately after which he commenced one of 7½ inches aperture, intended to be retained and mounted equatoreally for his own use. At his request I sent him some extremely difficult tests, selected from Mr. Otto Struve's *Pulkova Catalogue;* several of which have a central distance of little more than half a second, and some even less. Yet of all these I soon received from the ingenious maker (who has also proved himself an acute observer) perfectly correct diagrams; together with the places of one or two extremely difficult new double stars which he had discovered with this glass. As a specimen of these, I may mention 95 *Ceti*, which is at present favourably situated for observation. Though unwilling to part with this glass, Mr. Clark consented to let me have it to try against my Munich telescope; and in March 1854 it arrived, with its tube, finder, and eye-pieces.

Though the crown-glass has a considerable number of small bubbles, the performance of the telescope is not sensibly affected by that circumstance. In other respects the materials are good; and the figure is so excellent, and so uniform throughout the whole of the area, that its power is quite equal to anything which can be expected of the aperture; and, consequently, both in its illuminating and separating power, it is decidedly superior to my old favourite of $6\frac{1}{3}$ inches aperture. As a specimen of its light, I may mention the companion of *υ Ursæ Majoris* as having been pretty steadily seen with it; and also that I have never seen *Saturn* under tolerable circumstances during the present apparition without detecting *Enceladus*, even when at or very near his conjunctions with the planet. When exterior to a tangent to the extremity of the ring, this satellite has frequently been perceived as soon as my eye was applied to the telescope. Last spring it was seen several times in strong twilight; for instance, on March 16th, 17th, and 20th, at about 7^h G. M. T. In separating power, the glass is competent to divide a sixth-magnitude star composed of two equal stars, whose central distance is $0''{\cdot}6$.

I have thought it proper to premise thus much respecting the performance of the telescope, that a correct idea may be formed as to the degree of dependence to be placed upon the views it has afforded me of *Saturn;* the special subject of my present communication, to which I will now proceed.

1. *The outer Ring*, A. The interior edge of this ring is decidedly its brightest part: its light rapidly fades away towards the middle, where there is a very dark, narrow, well-defined line concentric with the ring, and about one-fifth of its breadth by careful estimation. This line has been always seen when the air was in a tolerably good state, and much more readily than last year. On the 26th November, 1854, it was traced more than half way round towards the ball, and was equally well seen at both ansæ. I have recorded on 10th January, 1855, "I am surprised at the positiveness of the dark line near the middle of this ring. It was well seen with every power from 355 to 1000." This is now the fourth apparition of *Saturn* in which I have noticed this dark line, and it does not appear to me to have varied in its position on the ring, or in its breadth and depth of shade.

2. *The interior bright Ring*, B. The concentric shaded bands on this ring have been on two or three of the most favourable occasions very well brought out. On this appearance I find the following notes in my journal:—

"1854, Nov. 26. The ring B is decidedly in *stripes*, and they are not *regularly* darker from the exterior one inwards. About one-fifth of the breadth of the ring, from its exterior edge, is very bright; then a narrow stripe is lightly shaded; immediately within that is a stripe decidedly lighter, though not so bright as the exterior fifth; next to that is a considerably darker stripe, and then a *much* darker one extending nearly to the interior edge,

where there is a *very* narrow *bright* line, far less decided than it was in 1851 and 1852."

"Dec. 7. By brief views the step-like character of the shading on ring B is visible; and I think the *outer* shaded band is *darker than the next interior one*, as I noticed one night before."

"1855, Jan. 10. The bands of shading towards the interior edge of this ring are occasionally well brought out; and I think the *second* from the outside is not quite so dark as the first,—at least in some parts of it, for I doubt if it be quite uniform. The narrow bright line at the interior edge is visible, but is not, I think, so bright as it was the two previous apparitions."

3. *The obscure semi-transparent Ring*, C, has been very well seen on several occasions; and I have noticed nothing remarkable about it except the occasional variations of its tint in different parts. Respecting this I have recorded as follows:—

"1854, Sept. 26. The dark ring is plainly seen, and appears to-night of the same tint at both ansæ. Its semi-transparency is very obvious across the ball, the edges of which can at times be distinctly traced down to the inner edge of ring B."

"Dec. 26. The dark ring is remarkably clear: the following end is *ruddier* than the preceding."

"1855, Jan. 10. The ring C is wonderfully well seen in general: rather ruddy on the preceding side, slate-coloured on the following side. The ball is seen plainly, though faintly, through it."

4. *The Ball.* Of its appearances I have the following notes:—

"1854, Sept. 26. The belts on the ball are not very distinct. The southern boundary of the broad dark belt, which is immediately south of the equator, is *not uniform*, or parallel to its northern edge. The belt, therefore, varies in breadth in different parts, and is at present ($13^h\ 45^m$ G. M. T.) broadest near the eastern edge of the ball. There is a very narrow light line seen interruptedly crossing the belt from east to west, a little south of its middle. The rest of the southern hemisphere is nearly uniform in colour, except that round the south pole is a belt of rather darker tint, and at about 40° of south latitude there is a very narrow belt less dark than the polar one."

"Dec. 7. The annexed sketch" (in the journal) "shows the form of the shadow of the ball on the ring B. It does not extend to the ring A at all; but I think a very small portion ($0''{\cdot}2 \pm$) of the southern edge of the ball is projected upon A."

"Dec. 16, $12^h\ 30^m \pm$ G. M. T. The south pole, or rather the most southerly part of the ball, is very dark,—much darker than the ring A, and I think rather darker than the broad belt near the equator. This renders the contrast with the small visible portions of its shadow less evident. I feel pretty sure that the southern edge of the ball encroaches a trifle on the ring A. There are no distinct and well-defined belts on the ball now."

"1855, Jan. 10, $9^h \pm$ G. M. T. The whole of the southern hemisphere of the ball is ruddy, and the parts near the equator

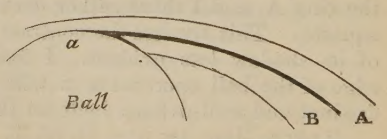
and at the southern edge are the darkest. Examined very carefully, and with all the various powers" (extending from 355 to 1000), "the position of the southern edge with respect to the edges of the rings at that part. The edge of the planet is so dark that it gives the impression sometimes of having a dark line there marking its contour. This darkness of the shading, at the very edge of the ball, renders it difficult to distinguish it from the division between the rings. But after long and careful examination, I am satisfied that *the ball extends over the division, and encroaches* 0″·2 *or* 0″·3 *on the ring* A. By carrying my eye across from the black division on one side to the other, I can see that, if continued in an uninterrupted line, it would *cut off a thin slice from the edge of the ball.* With very high powers (705 to 1000) the difference of colour of the southern edge of the ball, and the ring A at that point is more marked than with the lower powers; and long scrutiny with them confirms my impression that the ball encroaches slightly on A."

"$10^h\,36^m \pm$ G. M. T. Applied an excellent Huygenian eye-piece, giving power 860. It is admirable. The difference of colour of the southern edge of the ball and the ring A is obvious; and there is no doubt at all of the slight encroachment of the ball on its interior edge. Finding the light of the planet produce a very unfavourable effect upon my eye while endeavouring to estimate the degree of encroachment of the ball on A, it occurred to me to apply my solar eye-piece for the purpose of excluding the rest of the ball and rings, and leaving visible only the southern portion of the ball and the adjacent portion of the rings A and B. Power 506 (the highest, a double-convex lens). The effect is admirable. My eye having rested upon it for some time, the outline of the southern edge of the ball was far more distinctly seen than before, and leaves no doubt of its encroaching on the interior edge of A, to about 0″·3 by careful estimation. At times a little mottling can be discerned very near the southern limb of the ball. Its colour is very different from that of ring A; and it completely interrupts the black division which comes sharply up to the ball on both sides of it."

5. *The Shadow of the Ball on Ring* B. On this appearance I have noted as follows:—

"1854, Sept. 26. The shadow of the ball on ring B is nearly a straight line."

On Sept. 29 the projecting portion of the shadow, which has been noticed the last two or three years, was seen for the first time this season on the eastern side of the ball; cutting off the acute point of the ring B intercepted between the edge of the ball and the black division, as at *a* in the sketch, in which the appearance is much exaggerated.



At the same date I have remarked,—"I doubt if the shadow

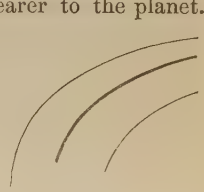
of the ball on ring B is really a straight line, though nearly so. It seems to be a little curved towards the southern end of it, close to the division." In the place indicated the edge is *convex* towards the ball.

"Nov. 26. Only a *very* narrow line of shadow from the ball falls on the west side, but there is a curious angular projection in the shadow on both the west and east sides of the apex of the ball."

"Dec. 7. The annexed sketch shows the form of the shadow

of the ball upon ring B." (Exaggerated in the sketch as respects the *size* of the shadow.)

6. *The Satellites.* I have usually estimated *Tethys* to be brighter than *Dione*, even when it has been nearer to the planet. This was remarkably the case on the 10th of this month, at $7^h \pm$ G. M.T. when both the satellites were near their greatest western elongation. At $11^h\ 19^m$ G. M.T., *Dione*, *Tethys*, and *Enceladus*, formed an equilateral triangle south-preceding the western end of the ring, thus,—



In No. 929 of the *Astron. Nachrichten*, is a most interesting account by Professor Secchi of the appearance of *Saturn* in the Munich equatoreal refractor, recently erected at the Observatory at Rome. The dimensions of the telescope are the same as those of the Dorpat refractor, the aperture of the object-glass being 9 Paris inches. The Professor characterises the night of Nov. 19 as one of extraordinary excellence, and doing full justice to the telescope. He describes the dark line on ring A as being just like a *pencil line* drawn upon it, which perfectly agrees with the views I have had of it since 1851; and with my description as "narrow, very dark, but not black." And when the dusky hue of the ring A is considered, it seems probable that this line would appear almost black if contrasted with a much brighter ground, such, for instance, as the exterior edge of the ring B. It deserves to be remarked that a dark line, precisely similar to this in appearance and situation, was seen on the *northern* surface of this ring, in the year 1838, by Professor Encke; and by Mr. Lassell and myself in 1842 (when we were not aware of Encke's observation). It may not be a *division* in the ring, as it was then supposed to be; but, if it is not, it is certainly extraordinary that precisely the same appearance should exist *on both surfaces of the ring*, and

should be, as it would seem, a permanent phenomenon in respect of its situation on the ring, and the darkness of its shade.

Professor Secchi has also described the step-like concentric bands of shading on ring B, exactly as they were described by myself on October 26, 1851; and as I have occasionally seen them almost precisely in the same way to the present time, it may fairly be concluded that they form a permanent feature of this ring. The Professor does not notice the *comparatively bright line* at the interior edge of B, which seems to me to render that edge pretty definite, though it is certainly less bright now than it was two or three years ago.

In one important point the impression received by Professor Secchi differs decidedly from my own, as stated in the present paper: viz. the place to which the southern edge of the ball is seen to extend on the rings. He states that the opening of the ring is such, that *the upper edge of the ball exactly touches the interior edge of the black division between* A *and* B, which was visible throughout the whole of its elliptic perimeter. It is singular that, on the 26th of September I arrived at precisely the same conclusion; but the state of the air was not such as to permit the advantageous use of high powers; and my subsequent observations, under much better circumstances, and especially on the 10th of this month, convinced me that my first impression was erroneous, or that a change to a considerable, and in fact *unaccountable*, amount had taken place.

The *first* satellite of *Saturn* (now usually called *Mimas*) is stated by Professor Secchi to have been seen on November 19th, near its greatest western elongation; having been found by putting the planet nearly out of the field, and afterwards seen steadily with the planet in full view. It is surprising that he does not mention *Enceladus*, which must have been close to *Mimas* at that time, if the latter occupied the place indicated. As my telescope has not shown me *Mimas*, I cannot say where that satellite might have been; but my own observations prove that *Enceladus* occupied precisely the situation which the Professor has ascribed to *Mimas;* and I cannot but think it probable that further observations may have convinced him that it was not the *first*, but the *second*, satellite which he saw.

The *bright zone on the ball*, which commences almost precisely at the equator, and extends northwards as far as the ring permits it to be seen, forms one of the most conspicuous features of the planet. It has been repeatedly referred to by Professor Secchi, as *caused by the reflection of the sun's light from the surface of the ring.* Two considerations seem to me to be quite conclusive against its arising at all from that cause. One is, that this bright zone occupied precisely the same situation, and was very conspicuous, *when the plane of the ring passed through the sun.* (See "Remarks on the Planet Saturn," by the Astronomer Royal, in the *Greenwich Observations* for 1848, p. 44.) The other is, that the reflection of the sun's light from the *southern* surface of

the ring, which now receives it, must necessarily fall upon the *southern* hemisphere of the ball, which has been remarkably dark ever since the southern surface of the ring has been illuminated; while the bright zone lies wholly in the *northern* hemisphere.—The remarkable obscurity of the southern hemisphere at the present time seems to indicate that the effect of the reflection from the surface of the ring is quite inappreciable as seen from the earth.

Wateringbury, Jan. 11, 1855,

Postscript.

"Jan. 14. The night proving fine, I again carefully examined *Saturn*, and made the following entry in my journal:—

"'$12^h\ 45^m$ G. M. T. *Saturn* is very fine at times, though about $3\frac{3}{4}^h$ past the meridian. It bears 705 very well; and with this power I have no doubt of the southern edge of the ball extending over the division between A and B, and encroaching a trifle on the interior edge of A. With low powers (355 or less) there is sometimes an appearance of the division extending across; but I am persuaded that this arises from the combined effect of the division coming up on each side so near the apex, and the *very* deep tint of the apex itself, which I think is *darker* than the darkest part of the broad belt close to the equator of the planet. It is certainly much darker than the ring A.'"

On Rating Chronometers by Lunars. By H. Toynbee, Esq., Commander of the Gloriana, East Indiaman.

Previous communications from Captain Toynbee on this subject will be found in the *Monthly Notices*, vol. ix. No. 7, and vol. xiv. pp. 19 and 243. In the present paper he shows that lunar distances taken from the stars and planets may be still more advantageously employed for determining chronometer errors and rates than those taken from the sun.

His method is to take several sets of good lunars on each side of the moon, if it may be, on consecutive days, and from the *mean* of the whole to deduce a chronometer *error* corresponding to the *mean epoch*. This is to be done every month. The *rate* is determined by a comparison of the *error* of each month with the error of the preceding month, and the examples adduced by Captain Toynbee of his own practice, and of that of Captain Quihampton of the Tudor, are exceedingly satisfactory.

It is to be feared that, partly from the practical difficulty attending lunar observations, and partly from the extended use of chronometers in navigation, this excellent and independent method of finding the longitude is going out of use. Yet in long voyages it must always be dangerous to rely solely on chronometers, unless they are numerous, and have been rated *with reference*

to the temperature, which is not the practice of private raters. Even then, there are so many causes which may operate to change the rates of chronometers at sea, that a conscientious officer ought never to risk his ship and the lives of his crew upon the going of his chronometers, without the additional check and security which he derives from lunars.

In his last voyages, Captain Toynbee has relied chiefly on lunar distances taken from the stars and planets, and they are generally taken on each side of the moon the same night. When distances are taken from both sides of the moon, most of the instrumental errors affect the results contrary ways, and almost to the same amount. Thus the index error and want of parallelism in the dark glasses disappear from the mean of east and west distances; and if the arc is nearly the same in both cases, even the defective plane of the index-glass, the want of perpendicularity in the index and horizon-glasses, and the error of the arc of the sextant, are nearly eliminated, or at any rate greatly attenuated. The sextant is so difficult an instrument to make and to adjust correctly, that only the very best artists can be trusted; and, after all, the observer should use it in such a way as to reduce as much as possible the effect of unavoidable and unknown errors: for this purpose he can scarcely follow a better example than Captain Toynbee.

The errors of the lunar tables are sometimes larger than would seem likely from Captain Toynbee's instances, yet his method of extending the observations (from which his mean distance is included) over so large an arc will tend to diminish even this effect, which cannot be completely guarded against. The *number* of observations gets pretty well rid of *casual* error, either of observation or of computation; and the instrumental errors are compensated by making them tell contrary ways.

The following instances will suffice to show the system pursued by Captain Toynbee and its results.

By a mean of 10 distances on each side of the moon on March 6, 7, 8, 9, 10, 11, chron. Dent, 1759, was found,—

1854, March 9, $14^m\ 39^s{\cdot}6$ fast on G.M.T.

By 18 distances taken similarly between May 1 and May 10, the chron. was found,—

1854, May 6, $22^m\ 38^s{\cdot}2$ fast on G.M.T.

By 14 similar distances taken between August 29 and Sept. 6, the chron. was found,—

1854, Sept. 2, $40^m\ 35^s{\cdot}6$ fast on G.M.T.

By 8 similar distances taken between Sept. 27 and Oct. 6, the chron. was found,—

1854, Oct. 1, $44^m\ 25^s{\cdot}9$ fast on G.M.T.

By 12 similar distances between Oct. 31 and Nov. 3, the chron. was found,—

1854, Nov. 1, $48^m\ 9^s{\cdot}9$ fast on G.M.T.

By 8 similar distances between Nov. 30 and Dec. 1, the chron. was found,—

1854, Dec. 1, $52^m\ 19^s{\cdot}8$ fast on G.M.T.

The partial results are good, but not extraordinary. The excellence of the *means* arises from the number of observations and the compensation of the opposite errors.

The chronometer seems to have performed with great regularity, as the rates from the above data are,—$8^s{\cdot}4$; $9^s{\cdot}1$; $7^s{\cdot}9$; $7^s{\cdot}2$; $8^s{\cdot}1$: all gaining.

The computed error of the chronometer from the above *errors* and *rates*, deduced solely from lunar distances, was verified at Calcutta and the Cape by the time-ball, and on the return to England by the maker; the differences amounted only to a few seconds.

The observations from which these results are deduced were taken while the moon was between new and full, and generally between 6^h and 10^m P.M.,—a time which best suited Captain Toynbee's convenience. He proposes hereafter to try morning observations, by which an independent error and new rate will be determined every fortnight. Whether this will repay the trouble depends on the chronometers, which, if good, and more than one in number, should keep the Greenwich M.T. for a month pretty safely. Towards the end of a voyage, the error of the chronometer cannot be too carefully determined, and once a fortnight is not too often.

Captain Quihampton says that he should have been a degree out of his reckoning if he had relied on his shore-errors and rates; but by his lunar rates he made the Island of Flores and the Islands of Scilly within a very few miles.

On the Orbit of α Centauri. By Eyre B. Powell, Esq.

In this paper the author gives the details of an investigation of the orbit of *α Centauri*. Two sets of elements are deduced by him. The following is the second set, which he appears to have derived from equations of condition involving the corrections of the original elements:—

τ	=	1858·012	
		° ′	
ϖ	=	29 33	
Ω	=	177 50	
γ	=	77 50	
e	=	·966	
n	=	4°·78	P = 75·3 years
	=	30′	

The following is a comparison between the results of these elements and the corresponding results of observation, where P_c denotes the calculated and P_o the observed angle of position; and D_c the calculated and D_o the observed distance.

Date.	P_c	P_o	$P_c - P_o$	D_c	D_o	$D_c - D_o$	Observer.
	° ′	° ′	′	″	″	″	
1826·012	212 23	213 11	−48	20·66	22·45	−1·79	Dunlop
1830·012	214 46	215 2	−16	19·1	19·95	− ·85	Johnson
1834·79	218 15	218 30	−15	16·84	17·4	− ·56	Herschel
1837·34	220 32	220 42	−10	15·48	16·11	− ·63	Herschel
1846·866	235 33	234 18	+75	9·85	9·82	+ ·03	Jacob
1848·023	238 53	237 59	+54	8·61	8·05	+ ·56	Jacob
1850·956	251 13	250 43	+30	6·5	5·97	+ ·53	Jacob
1853·049	266 15	267 34	−79	5·03	4·55	+ ·48	Jacob
1854·003	276 19	276 20	− 1	4·45	4·21	+ ·24	Jacob & Self
1854·632	284 19	283 32	+47	...	...	...	Self

The author remarks that the time of the next periastral passage probably lies between 1857·5 and 1858·5, and that the semi-axis major of the orbit is a little greater than 30″.

The following is a letter from Mr. Hind to Admiral Smyth in reference to the orbit of the same star:—

"I believe a paper upon the elements of *α Centauri* was referred to you for report yesterday. I have recently deduced an orbit for the same star, not being aware that any one else was engaged upon the same investigation. My results, in which I have some confidence, are founded upon all the micrometrical measures from 1834 onwards, including the excellent series by Capt. Jacob down to the present year. I have thought you might like to have the elements for comparison with those given in the communication to the R.A.S. which I have not seen:—

Per. pass.	1859·42
☊	16° 42′
λ	26 2
Eccentricity	0·7752
Mean annual motion	+ 4°·448
γ	62° 53′
α	13″·57
Period	80·94 yrs.

"These elements agree very well with the observations, so far as I have examined them.

"*Dec.* 9, 1851."

On an Appearance seen in the Moon. By Robert Hart, Esq.

(*Letter to the Astronomer Royal.*)

"On the night of the 27th December, 1854, between 6 and 7 P.M., the moon was very bright. I had brought my 10-inch reflector to bear upon the moon; on the shaded side of the disk I observed a white spot, where I have marked it on the sketch. As it was of the colour of the light of the moon, and not like star-light, I thought it part of the moon; but as it disappeared in less than a minute after I first observed it, I concluded it was a star eclipsed by the moon.* I now turned my attention to the light part of the disk, and my eye was at once attracted by an appearance I had never seen before on the surface of the moon, although I have observed her often during these last forty years. She was $8^d\ 4^h$ old at the time, and just on the edge of the light, where I have marked on the sketch, there were *two luminous spots*, one on either side of a small ridge, *which ridge was in the light*, and of the same colour as the moon; but these spots were of *a yellow flame colour*, while all the rest of the enlightened part was of a snowy white, and the mountain-tops that were coming into the light, *and just on the shadow side of these spots, were of the same colour as the moon.* The lights of these spots were *like the light of the setting sun reflected from a window a mile or two off.* I observed it for five hours. I thought them rather less bright than as first seen, *but very little less;* so bright were they, when the instrument was the least thing out of focus, they showed *rays around them as a star would do.*

"As I live about two miles out of Glasgow, I had no scientific friend with me at the time, but I called the attention of three gentlemen, my neighbours, and my own household, and they all described the appearance as I saw it myself, and have given above.

"I would have followed it longer had I been able, but the wind was very cold, 20°·5, and I had no shelter, as I take my telescope outside. I left off about 12 P.M.; and from the cloudy weather, I never saw the moon until she was nearly full, then only a few minutes, and again on the 10th January, at 4 A.M.; but the haze was too thick. I thought I might see them in the shade, but I could not: I have never seen her since.

"May I ask the favour of your laying this before the Astronomical Society, that we might learn if any of the members have observed this appearance in the moon, or have heard that it was seen by others. I shall be happy to learn if it has been taken notice of by any other observer, and their opinion of it.

"It appeared to me, from the brightness of the light and the contrast of colour, *to be two active volcanoes or two mouths of one in action.*

* This was, no doubt, the occultation of μ *Piscium*, which, according to the *Nautical Almanac*, was in conjunction with the moon at $6^h\ 54^m\ 10^s$, on the evening of December 27, 1854.—Editor.

"If there was no star eclipsed by the moon at or about 7 P.M. that night, the white spot that was more like one of the mountain-tops tipped with light than a star, may have had some connexion with it.

"*Cessnock Park, January 15th*, 1855."

Discovery of a New Comet (Comet I. 1855).
By M. Winnecke.

On the morning of the 15th of January, M. Winnecke discovered at Berlin, in the vicinity of γ *Hydræ*, a faint granulous nebula, the estimated position of which was,—

Jan. 14, 18^h	$225° 20'$	$-27° 11'$

On the next morning it was found to have shifted its place. The following observation of its position was obtained by the discoverer and M. Bruhns:—

	Berlin M.T.	R.A.	Decl.
	h m s	° ′ ″	° ′ ″
Jan. 15	18 4 16·2	226 5 15·4	−27 15 5·3

Apparent place of the star of comparison,—

	R.A.	Decl.
	° ′ ″	° ′ ″
Argel Z 373, No. 57	226 38 16	−27 18 42·4

The daily motion is consequently,—

In R.A. about	$+45'$
Dec. --	$-4'$

The comet has also been discovered independently by M. Dien, at the Imperial Observatory, Paris.

M. Bruhns has calculated an ephemeris of the comet, extending from Jan. 14 to Feb. 17, printed copies of which have been circulated by M. Peters, the editor of the *Astronomische Nachrichten*.

The weather has hitherto been very unfavourable for observing this comet in England.

On the Orbit of the Binary Star σ Coronæ Borealis.
By Eyre B. Powell, Esq.

"Three orbits have been already arrived at for this star, viz. that computed by Sir John Herschel, and the approximately inter-accordant ones of Messrs. Hind and Mädler; it may, therefore, appear, at first sight, a work of supererogation to investigate a fresh set of elements. The startling difference, however, that exists between Sir J. Herschel's orbit and the other two, will,

perhaps, be held to excuse my troubling the Society with the present communication.

"By the graphical method I obtained the following results for the apparent orbit of σ.

$a = 2''{\cdot}725$
$e = {\cdot}6479$
Minimum distance $= 1''{\cdot}27$
Position for do. $= 91° 20'$
Maximum distance $= 2''{\cdot}74$
Position for do. $= 324° 30'$

"The apparent ellipse then gave the elements of the real orbit as follow:—

$\sigma = 1829{\cdot}7$
$\varpi = 102° 50'$
$\Omega = 3\ 8$
$\gamma = 45\ 6$; $\lambda = 96° 53'$
$e = {\cdot}3887$
$n = +1°{\cdot}5$, Period = 240 years.
$d = 2''{\cdot}94$

"I annex two tables, one affording a comparison between the results of computation and those of observation for angles of position, the other effecting the same object for distances.

Comparison of Calculated and Observed Positions.

Date.	θ_c	θ_o	$\theta_c - \theta_o$	Observers.
	° ′	° ′	° ′	
1780·6	347 48	347 32	+ 16	♅ sec. *Cycle* *
1781·79	348 57	347 32	+1 25	♅ sec. H
1802·74	13 58	11 24	+2 34	♅
1822·48	66 44	66 24	+ 20	H & S, Σ†
1824·45	75 57	75 10	+ 47	H & S, S‡
1826·77	87 37	89 0	−1 23	Σ
1830·52	107 3	106 51	+ 12	H, D, Sm§
1831·34	111 9	111 32	− 23	D
1832·459	116 37	115 26	+1 11	D, Sm‖
1833·47	121 20	120 39	+ 41	D, Sm¶
1835·5	130 11	130 54	− 43	Sm
1839·67	145 27	145 6	+ 21	Sm
1843·35	156 8	155 54	+ 14	Sm
1846·22	163 6	163 45	− 39	J
1853·513	177 7	176 59	+ 8	J & Self**

* I believe the *Cycle* follows the *Philosoph. Trans.* See vol. v. Astron. Soc. *Memoirs.*

† 1821·3 65° 15′ H & S; 1822·67 61° 0′ Σ; 1823·47 72° 56′ H & S.

‡ 1823·47 72° 56′ H & S; 1825·44 77° 31′ S.

§ 1830·28 105° 5′ H; 1830·52 107° 17′ D; 1830·76 107° 36′ Sm.

‖ 1832·549 115° 57′ D; 1832·37 114° 54′ Sm.

¶ 1833·36 120° 37′ D; 1833·58 120° 42′ Sm.

** 1853·142 177° 54′ J; 1853·348 175° 12′ Self; 1854·048 177° 52′ J.

Comparison of Calculated and Observed Distances.

Date.	d_c	d_o	$d_c - d_o$	Observers.	Remarks.
	″	″	″		
1823·47	1·34	1·45	−·11	H & S	
1826·77	1·28	1·3	−·02	Σ	
1830·52	1·29	1·26	+·03	H, Sm	1830·28, 1″·22 H; 1830·76, 1″·3 Sm
1832·37	1·33	1·4	−·07	Sm	
1833·47	1·36	1·25	+·11	D, Sm	1833·36, 1″·3 D; 1833·58, 1″·2 Sm
1835·5	1·43	1·4	+·03	Sm	
1839·67	1·62	1·6	+·02	Sm	
1843·35	1·7975	1·8	−·0025	Sm	
1846·22	1·94	1·87	+·07	J	
1853·7	2·25	2·21	+·04	J	

H stands for Sir W. Herschel; H for Sir J. Herschel; Σ for Prof. Struve; S for Sir J. South; Sm for Admiral Smyth; D for the Rev. Mr. Dawes; J for Captain Jacob.

"It is not necessary to dwell upon the foregoing; but I would remark that my orbit approaches much nearer to the early one of Sir J. Herschel than it does to those computed by Messrs. Mädler and Hind at more recent dates. So far as I am able to judge, there does not appear to be ground for believing the period to extend over six or seven hundred years.

"I did not think it worth while to form equations of condition with the view of correcting the elements, as the orbit represents the observations, more especially those of distance, with very considerable accuracy: indeed in no other case have I arrived at equally respectable results, I will not say after the first, but even after the third or fourth approximation.

"*Madras, Nov. 20th*, 1854."

Observations of the Zodiacal Light in 1854.

By T. W. Burr, Esq.

In continuation of my previous notice of the zodiacal light, I have to report that in the spring of 1854 I observed it on the evenings of February 16th, 18th, 23d, 25th, and 26th; March 17th, 21st, 23d, 27th, and 30th; and April 17th. The first and two last appearances were mere glimpses, but on February 18th the view was exceedingly good; and those of 21st March from $8^h\ 10^m$ to 9^h Greenwich mean time, and 23d March from 8^h to $8^h\ 30^m$, were as fine as possible in this latitude and locality.

It is unnecessary to describe its course and appearance with any great minuteness, as there is always a difficulty in ascertaining its exact extent. Generally it very much resembled the description I gave of it in the preceding year, extending in the early

observations to the vicinity of the Pleiades, and in the later ones to that of *Aldebaran*. Upon the whole its boundaries were not so well defined as in 1853.

I have observed occasional sudden variations in its brightness, but have been unable to detect anything like a periodicity in these changes; and knowing the great influence of atmospheric causes on objects having low altitude, I should hesitate to ascribe them to a real variation in the brightness of the light. Generally speaking, when best seen, the brilliancy was greater than that of the milky way, which was usually visible at the same time in the north-west.

Highbury, January 1855.

On the Pendulum Experiment for Illustrating the Rotation of the Earth. By Lieut. Ashe, R.N.

After some geometrical illustrations, the author gives the following description of the pendulum employed by him in these experiments:—

"In the centre of an equilateral plate a small hole was drilled, through which a piece of the best pianoforte wire, a foot in length, was put, fitting tight, and secured to the plate by the wire having a nut screwed on the end of it, and a loop was turned at the other end of the wire. To this steel circular spring a copper wire, stretched and rubbed, was attached; the length of pendulum was 52 feet, and the weight, a leaden sphere, 17 lbs. The plate was firmly screwed to a beam in the steeple of Chalmers' Church of this city (Quebec); the pendulum was protected from any current of air. At about the height of the eye, when sitting down, a wooden circle, 4 inches broad, 3 inches thick, and 8 feet in diameter, was fixed and graduated on the inner edge, so that by placing the eye on a level with the circumference, the time of the wire coinciding with each degree could be noted with great nicety.

"I found steel wire more unsatisfactory in its results than any other sort, in consequence of its being so very sonorous,—so much so, that the noise of a cricket, or any other sound that would harmonise with the wire, produced undulations."

Description of Shepherd's Galvano-Magnetic Regulator. By Henry S. Ellis.

(*Communicated by Dr. Lee.*)

I beg to forward a description of the galvano-magnetic regulator and apparatus, which have been manufactured by the

patentee, Mr. C. Shepherd, of Leadenhall Street, and placed in the Exeter Guildhall, for the purpose of giving hour-signals to the cathedral clock, and denoting uniform time throughout this city. In further explanation of the same I enclose three drawings.*

No. 1 is a general outline of the regulator, and is very similar to the one at the Greenwich Observatory, except that there is no contact-spring in connexion with the hour-wheel, which was found to be unnecessary.

No. 2 is the dial of the regulator, and shows the contact-springs for giving hour-signals to the cathedral clock. The lower pair of springs (A) is brought into contact with each other every hour, when the pin (B) in the minute-wheel presses them together; and similarly the upper pair of springs (C) are brought into contact every minute by the pin (D) in the stud underneath the seconds hand; but the whole circuit, between the batteries and the magnets at the cathedral, is not completed until both the lower and the upper pairs of springs make contact simultaneously; and as seven seconds elapse between the signal and the first blow struck on the bell, the contacts are made in anticipation of the hour, so that the striking shall coincide exactly with time shown by the regulator.

No. 3 is the old striking part of the cathedral clock, and the new galvano-magnetic apparatus which is placed in electric connexion with the regulator. When the hour-signal is given, the armature (A) is drawn down on the poles of the magnets (B B), the perpendicular to it is brought forward, and the hammer (D) falls on the tail of detent (E); the stop-piece (F F) is then released, and the striking train performs its work. The pin-wheel (G) raises the hammer (D) again into its horizontal position in readiness for the next hour.

The whole of the iron work in the new apparatus was made much heavier than is absolutely necessary. At first twenty-four of Smee's batteries were requisite to draw the armatures to the magnets; but by lessening the weight of the hammer (C) and the counterpoise (H), it has been found that nine of the same batteries are sufficient—although, to guard against a want of power, and to prevent the necessity of frequent charging, a larger number is now applied. Other parts might be made considerably lighter, and were that done probably about six batteries would be sufficient.

It may be remarked, that if a simple galvanometer could be attached to show the waste of battery power it would be a great convenience.

It is proposed to place a large electric dial, or dials, on the exterior of the Guildhall, and some of the distant parishes have it in contemplation to purchase new clocks, and to put them in connexion with the Guildhall regulator. Indeed, I believe it would

* See Illustrations at the end of this Notice.

be practicable to connect all the existing old clocks and dials with it, at a trifling cost beyond that of laying down the electric wires.

When the Electric Telegraph Company bring their wires into the city, it is hoped that they will give the Exonians the benefit of one of the Astronomer Royal's daily signals—the deflection of a needle in immediate proximity to the regulator would be sufficient. For the present a 12-inch sympathetic dial of Shepherd's in my own observatory reports to me the performance of the regulator; and there will be little difficulty in making all the public clocks indicate and strike Greenwich mean time, within a second, throughout the year.

In conclusion, I have to acknowledge, with my very best thanks, the readiness with which the Dean and Chapter permitted the cathedral clock to be connected with the Guildhall regulator; and also the cordial support received from the Right Worshipful the Mayor, the Town Council, and others interested in the carrying out of these chronometrical arrangements.

Exeter, November 8, 1854.

Observations of the Solar Spots. By Dr. Wolf.

1854.	Days of Observation.	Days free of Spots.	Number of new Groups in the Month.
January	23	4	4
February	22	6	4
March	29	6	7
April	25	2	6
May	28	7	7
June	30	1	9
July	29	4	7
August	30	4	4
September	30	5	7
October	24	8	5
November	16	0	4
December	18	4	4
	304	51	68

The following table exhibits a synopsis of the condition of the sun during the last six years, in regard to the relative mean number of groups of spots visible on his disk in each month of the year. In order to take some account of the magnitude of the groups, the results are increased by one-tenth of the number of spots visible.

	1849.	1850.	1851.	1852.	1853.	1854.
Jan.	17·3	10·3	9·0	7·6	4·2	1·4
Feb.	14·3	10·0	10·0	6·3	5·1	1·7
March	10·1	8·8	6·8	6·7	3·3	1·9
April	11·5	3·6	6·1	6·7	5·0	3·1
May	9·6	5·4	7·0	5·4	3·5	2·2
June	9·8	10·5	6·5	4·8	5·0	2·0
July	9·0	4·8	3·1	4·4	4·7	1·9
Aug.	7·0	6·7	6·2	4·4	5·3	1·6
Sept.	10·1	9·1	7·4	3·6	3·1	2·4
Oct.	9·0	9·2	6·3	10·2	4·5	1·7
Nov.	11·9	4·8	6·1	6·7	2·8	2·0
Dec.	10·9	5·2	6·8	5·3	2·6	1·5
Sum	130·7	88·4	81·3	72·1	49·1	23·4

These results seem to agree with the period of the solar spots which Dr. Wolf has assigned, according to which the minimum of the number of groups falls in the latter half of the year 1855.

Dr. Drew has for sale a 30-inch transit-circle by the late Mr. Jones, of Charing Cross. The telescope is of $3\frac{1}{2}$-feet focal length, with an object-glass of $3\frac{1}{4}$ inches diameter. The circle is read off by three microscopes mounted on solid stone arms; is provided with a micrometer eye-piece and every means for the nicest adjustment. The collimation-error may be corrected either by reflection or by the aid of two collimators which accompany the instrument. Price, with the stone mounting, 100*l.*

A drawing and description of the instrument will be forwarded by Mr. Williams, the Assistant-Secretary of the Society, to any person applying for the same.

ERRATA.

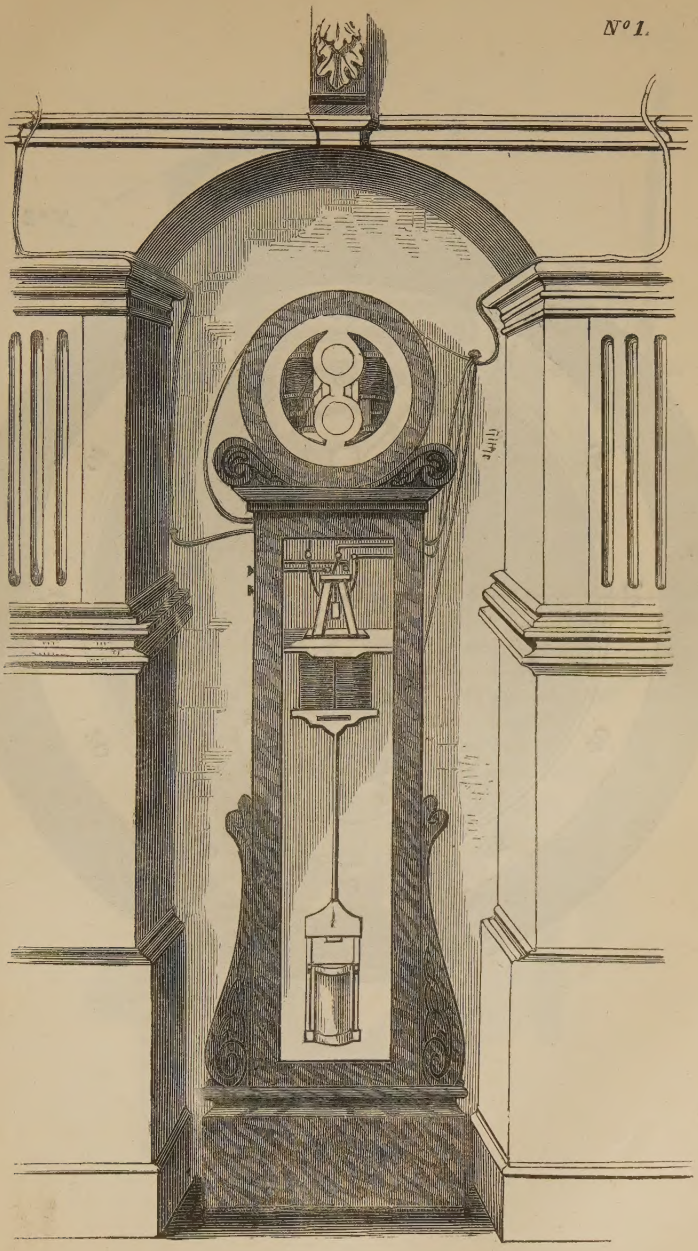
The reader is requested to correct the following errata, which were committed in the translation of Professor Hansen's paper on the Construction of New Lunar Tables, &c., inserted in the *Monthly Notices* for November last:—

Page 12, line 8 from bottom, *for* a large number, *read* a moderate number.

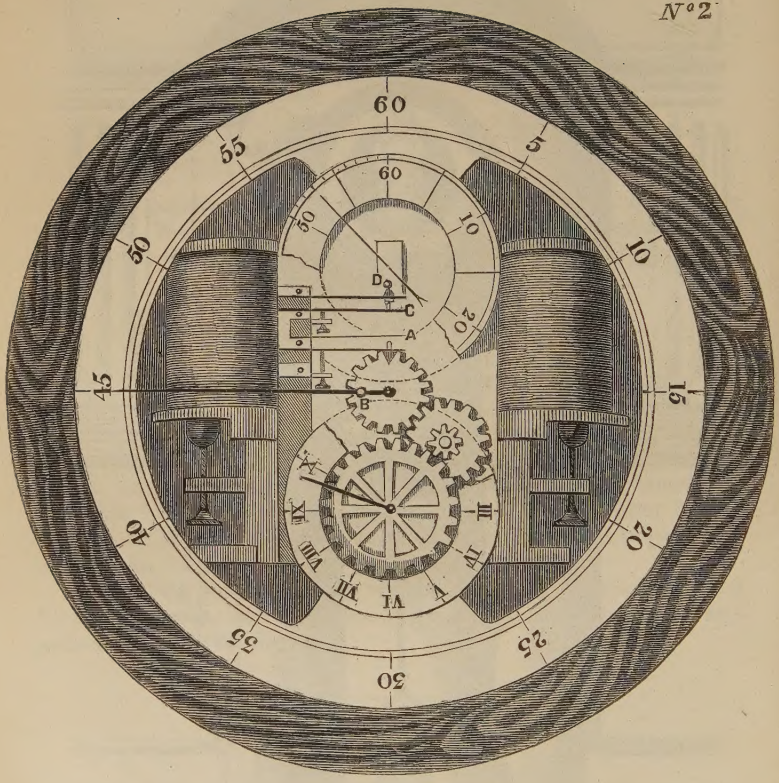
— 14, line 1, *for* were different, *read* were not different.

— 14, last line, *for* greater than unity, *read* less than unity (kleiner wie Eins).

N° 1.



N°2



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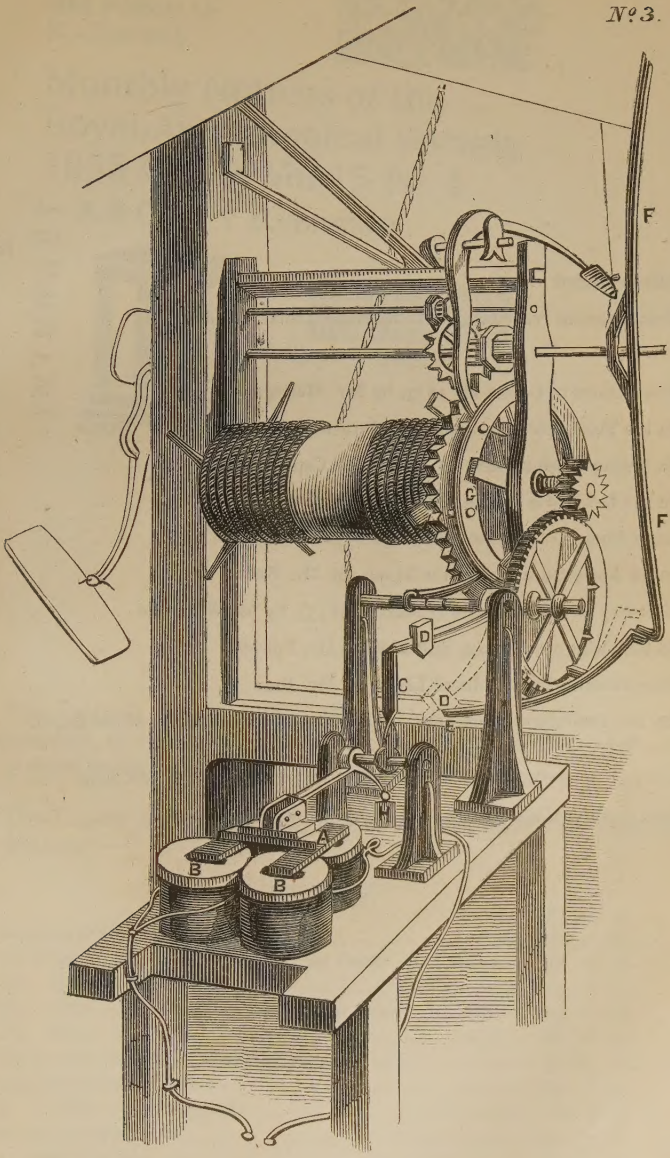

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